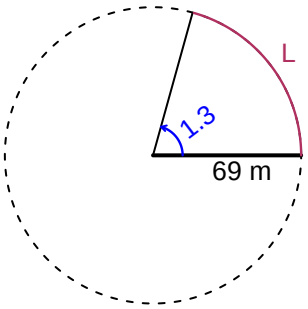
Name: Date:

Trig Final (Solution v16)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 1.3 radians. The radius is 69 meters. How long is the arc in meters?

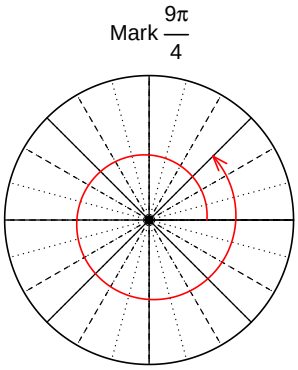


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

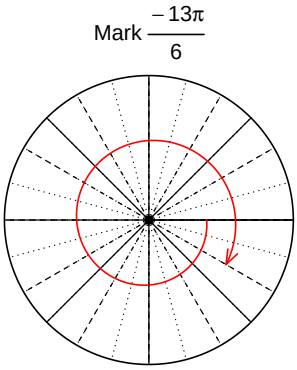
$L = 89.7$ meters.

Question 2

Consider angles $\frac{9\pi}{4}$ and $\frac{-13\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{9\pi}{4}\right)$ and $\sin\left(\frac{-13\pi}{6}\right)$ by using a unit circle (provided separately).



Find $\cos(9\pi/4)$



Find $\sin(-13\pi/6)$

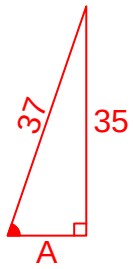
$\cos(9\pi/4) = \frac{\sqrt{2}}{2}$

$\sin(-13\pi/6) = \frac{-1}{2}$

Question 3

If $\sin(\theta) = \frac{35}{37}$, and θ is in quadrant II, determine an exact value for $\cos(\theta)$.

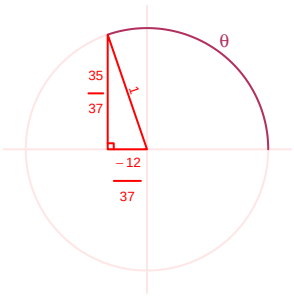
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$A^2 + 35^2 = 37^2$$
$$A = \sqrt{37^2 - 35^2}$$
$$A = 12$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\cos(\theta) = \frac{-12}{37}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = 2.38$ meters, an amplitude of 4.14 meters, and a frequency of 7.02 Hz. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 4.14\sin(2\pi 7.02t) + 2.38$$

or

$$y = 4.14\sin(14.04\pi t) + 2.38$$

or

$$y = 4.14\sin(44.11t) + 2.38$$